

innodb_flush_method

Tuning innodb_flush_method variable

Basic Details

The innodb_flush_method variable instructs InnoDB on how to open and flush log and data files. Innodb_flush_method value is automatically configured to the default value when not explicitly defined.

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| Name | MySQL | Percona | MariaDB |
|---------------|--|--|--|
| Variable | innodb_flush_method | | |
| Configuration | Supported | | |
| Scope | Global | | |
| Dynamic | No | | |
| Data Type | string | enumeration | enumeration (>= MariaDB 10.3.7) String (<= MariaDB 10.3.6) |
| Default Value | fsync (Unix) | fdatsync (5.7.10) NULL(5.6.13) | O_DIRECT (Unix, >= MariaDB 10.6.0 fsync (Unix, >= MariaDB 10.3.7, <= MariaDB 10.5) |
| Valid Values | fsyncO_DSYNC littlesync nosync O_DIRECT O_DIRECT_NO_F_SYNC | fsync O_DSYNC O_DIRECT O_DIRECT_NO_FSYNC ALL_O_DIRECT littlesync (5.6.13 only) nosync (5.6.13 only) | fsync O_DSYNC O_DIRECT O_DIRECT_NO_FSYNC ALL_O_DIRECT (>= MariaDB 5.5 to <= MariaDB 10.1, XtraDB only) |

innodb_flush_method – Usage

The innodb_flush_method variable is used to define how log and data files are flushed from InnoDB.

Optimizing this value may yield improvements in I/O throughput.

Innodb_flush_method configuration can cause unexpected and unwanted results. Testing and benchmarking is recommended. The most common configuration is setting innodb_flush_method to O_DIRECT. This reduces swap pressure by preventing unnecessary double buffering, which is when the operating system is buffering some data in its cache alongside InnoDB's caches.

For reference, the innodb_flush_method default values for MySQL, Percona, and MariaDB are listed above.

Innodb_flush_method variable configuration:

1. To change innodb_flush_method in the command line, enter:

*–innodb-flush-method= **VALUE***

Replace the bolded value with the best option for your database.

2. You can also change the value of innodb_flush_method using a configuration file.

To do so, you will use mysqld. You will need to restart MySQL:

[mysqld]

*Innodb_flush_method **NAME***

Adjust the bolded value with one of the valid variable values, to suit your database needs.

Selecting innodb_flush_method value for configuration

Reminder that changes to innodb_flush_method should be tested and benchmarked thoroughly beforehand to prevent unexpected behaviors. To select the best value for innodb_flush_method, you can learn more about each value below.

Innodb_flush_method configuration for Unix systems:

1. fdatasync:

- default for Percona, flushes only data

2. fsync():

- default for MySQL and versions of MariaDB <= 10.5 and >= 10.37
- flushes data, associated metadata, and log files
- causes double buffering

3. O_DIRECT:

- default for MariaDB >= 10.6
- the best configuration recommendation for most file systems
- O_DIRECT responsible for opening files
- Flushes only data files
- Flushes files to disk using fsync() method to ensures no double buffering
- All reads and writes goes directly to disk.
- While flushing, double buffering & read ahead is disabled

3. O_DSYNC:

- Flushes only data files
- All writes synchronous
- O_SYNC flag set to open()
- O_SYNC doesn't disable double buffering
- O_DSYNC will flush data, while O_SYNC flushes both data and metadata

4. O_DIRECT_NO_FSYNC

- O_DIRECT used when flushing I/O, afterwards fsync() is skipped
- Cannot be used with XFS file systems.
- Not recommended over O_DIRECT in most use cases

5. ALL_O_DIRECT

- Only available with XtraDB
- O_DIRECT used to open data and log files
- fsync() flushes data files but not logs
- Only recommended with large InnoDB files, or may experience performance deterioration

6. littlesync

- Used for internal performance testing and is currently unsupported. Not recommended.

7. nosync

- Used for internal performance testing and is currently unsupported. Not recommended.